

# CELL CYCLE & CELL DIV SUMMARY SHEET:-

- Cell division is of two types → mitosis & meiosis.
- The DNA in prokaryotes is one double stranded circular DNA attached to the inside of cell membrane.
- Eukaryotes store genetic information in chromosome.

## Mitosis

Mitosis:- (Flourishing and the turn)

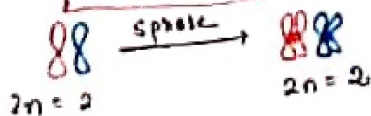
- Mitosis has two stages:-
  - Interphase (growth phase)
  - Karyokinesis & cytokinesis (div. phase)

i) Interphase:- (Occupies 95% of cell cycle)  
 ↳ cell is most active metabolically in interphase.  
 It is divided into three parts.

i) G<sub>1</sub> phase - All raw material for S phase is (12 hrs) synthesized.  
 • no. of organelles increases.  
 • Proteins such as DNA polymerase, Non-histone protein, histone proteins are synthesized.

ii) S phase - Replication of centrioles occurs. (6-8 hrs)  
 • DNA content doubles but chromosome no. remains same.

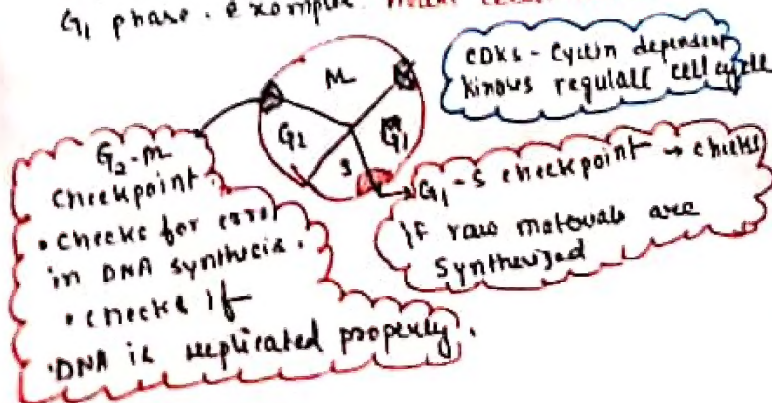
Chromosomes



iii) G<sub>2</sub> phase - Massive production of tubulin occurs which gives rise to spindle apparatus. (3-4 hours)

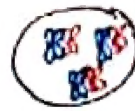
- Replication of centrioles completed.
- Cell size increases.
- However, maximum cell growth occurs in G<sub>1</sub>.

• Many cells are metabolically inactive but don't divide and enter G<sub>0</sub> phase after G<sub>1</sub> phase. examples: heart cells, nervous tissue.



## Mitosis

### Prophase:



- chromosomes are formed
- nucleolus and nuclear membrane disappears.
- centrioles move to opp. poles.
- No. cell organelles observed.
- mitosis in plants is anastrial and mitosis in animal is astral or amphistrial.

### Metaphase:



- chromosomes form metaphase plate.
- Discontinuous fibre - have chromosome.
- Continuous fibre - don't have chromosome.
- Mitotic poisons such as colchicine arrest cell division @ metaphase doubling ploidy.

### Anaphase:



- chromosomes move to opp. poles.
- centromeres divide and integronal fibres pull chromatids apart while spindle fibres pull the chromatids apart.
- Spindle fibre has 97% tubulin & 3% RNA.

### Telophase:



- Sister chromatids @ opposite poles.
  - Spindle disassembles.
  - Nuclear membrane reappears.
  - forms, nucleus reappears.
- NOTE: N/C ↑ (Nuclear cytoplasmic ratio ↑), cell division ↑, activity ↑  
 SA/V ↑ (Surface area/volume ratio ↑), cell division ↑, activity ↑.

Cytokinesis: In animals forms due to furrow, at the plasma membrane, centripetal.

In animals due to a cell plate formed by Golgi vesicles, ER, remnants of spindle fibres which give rise to cell plate → centrifugal.

## Modification of Mitosis

- a) Uncontrolled mitosis → unlimited mitosis leads to formation of tumour.
- Occurs due to cellular oncogenes.



- 6) **Promitosis**: mitosis occurs with all the usual steps of karyokinesis but nuclear membrane does not disintegrate.  
• Found in amoeba.

- 7) **Free nuclear division**: - karyokinesis not followed by cytokinesis. Example: endosperm, fungi of phicomycetous group.

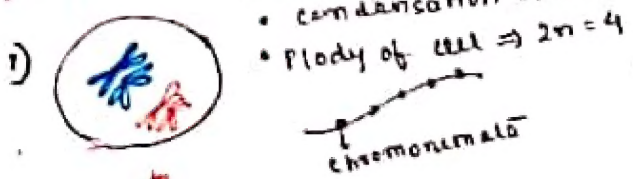
## Meiosis

- Referred to as reductional division.
- chromosome number halves.
- Name proposed by Farmen & Moore.
- Found in gamete forming cells.

### Meiosis I → Prophase I:-

1. **Leptotene**: condensation.
2. **Zygotene**: pairing of homologous chromosome.
3. **Diplotene**: chiasmata clearly visible.
4. **Diakinesis**: ~~terminalization~~ of chiasmata.
5. **Pachytene**: crossing over occurs.

- 1) **Leptotene**: - chromatin network visible as thick threads.



- condensation starts.
- Ploidy of cell  $\Rightarrow 2n = 4$

chromonemata

### 2) Zygotene:



- chromosomes which are homologous pair forming bivalent or tetrad.
- Synaptonemal complex formed.

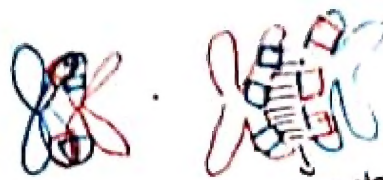


synaptonemal complex  $\rightarrow$  ribonucleoprotein complex made mainly of protein ubiquitin. Synaptonemal complex was first observed in Crayfish by Möhr.

- 3) **Pachytene**: Recombination nodules occur in the synaptonemal complex which lead to cross over non-sister chromatids.



- bridge like synaptonemal complex
- enzyme recombination
- Enzyme recombination leads to recombination of parts of chromosomes (genes) between non-sister chromatids to be exchanged.



synaptonemal complex.

- Pachytene stage involves crossing over or exchange of corresponding parts of chromosome between non-sister chromatids.
- It is the longest stage of prophase I.

- Diplotene**: Marked by the dissolution of synaptonemal complex.
- Terminalization starts
  - Chiasmata appear clearly.

- Diakinesis**: • Terminalization of chiasmata ends.

**Anaphase I**: metaphase plate of homologous chromosome form.

**Anaphase I**: - Homologous chromosome move to opposite poles.

**Telophase I**: - Followed by meiosis 2. Transition phase between meiosis 1 & 2.

- 4) **Meiosis 2**: - Just like mitosis. Equational div.

### Amitosis $\rightarrow$ observed by Flemming

- Simple form of cell div.
- Nuclear material divides into two
- cell wall formed
- Two cells are formed

